American Electro-platers' Society

(An Educational Society)

LIBRARY OF CONGRESS
MAR 27 1915
PERIODICAL DIVISION

Chartered 1909

MONTHLY REVIEW

MARCH, 1915

Copyright, March, 1915, by American Electro-platers' Society

This book is the property of the members of the American Electro-platers' Society, and any infringement of this copyright will be prosecuted to the full extent of the law.

INDEX

	Page
Editorial Staff	2
Editorial—Nickel Solutions and Publicity	3
Standardization of Processes used by Electro-platers	5
Analysis of a Silver Solution	7
Ormula Dips and Dipping	10
Conductors for Copper Solutions	14
Determination of Copper in Copper Plating Solutions	16
Electro Coloring of Metals	16
The Relationship of Chemistry to Modern Industry	18
The Plater's Boomerang	20
Comment and Criticism	22
What the Branches are Doing	26

EDITORIAL STAFF

H. E. WILLMORE, Editor-in-Chief
5911 South Boulevard, Chicago, Illinois

Associate Editors

Col. J. H. Hansjosten, President Supreme Society
George B. Hogaboom, Past President Supreme Society
C. H. Proctor, Honorary Member Supreme Society
Oscar E. Servis, President Chicago Branch
Harry de Joannis, Bridgeport Branch
Fred J. Liscomb, Chicago Branch
Ernest Lamoureux, Chicago Branch

I shall pass through this world but once. Any good thing, therefore, that I can do, or any kindness that I can show to any human being, let me do it now. Let me neither defer nor neglect it, for I shall not pass this way again.—Amiel.

MAR 25 1915

©CI.B331290

MONTLHY REVIEW
American Electro-platers' Society
(An Educational Society)

Vol. 1 MARCH, 1915 No. 10

Editorial

NICKEL SOLUTIONS AND PUBLICITY

Standardization of Solutions apparently seems to be the main issue within the A. E. S., and of all subjects the nickel solution is given much thought. Investigations along those lines are now being taken up by the plater. This solution is worthy of much consideration, as it is universally used and is really the mainstay of the electro-plater.

There has been much criticism pro and con of the regular cold solution, but we have yet to hear from the critic on the "hot solution." The plater, it seems, has given this matter but very little thought; perhaps simply because he had never given it a thorough trial or serious consideration.

It is a known fact that steel sheets that have been nickeled and polished are or were manufactured in Europe, and imported into this country. This material found a big market for certain classes of goods because the sheets can be cut, stamped, bent, formed and worked into various articles, without any signs of peeling or chipping under the dies, and it has been found that in this process the hot solution is used. We well know that nickeling of sheet zinc on an extensive scale is successfully carried on in this country, in a manner that will withstand rough treatment under the dies; also stampings of various kinds of steel and brass are finished in the burnishing lathe with success that have been plated in the cold solution.

Since reading Dr. Watts' paper entitled "Some Observations on Nickel Solutions," read at the Chicago Banquet last December inquiries have been made and it was learned that at least one large stove company in this country is using the hot method of nickeling their goods, and the condition of the deposit is highly satisfactory, is soft and very easily buffed to color.

While both solutions may have their adherents, nevertheless, there is no question that the hot solution has many advantages, as a greater current density can be maintained and a heavier, more homogenous, softer, smoother and more flexible deposit can be obtained in a shorter period of time. Possibly it may not prove applicable in all cases, because of additional investments, such as new tanks, especially if the old ones are leaky and ready

to be relegated to the scrap heap; also where heating installations will involve large expenditures or cannot be readily obtained, but remember it is not necessary to operate the solution hot, but warm, 100 to 120 deg. Fahr. will give excellent results. A thorough consideration and investigation along this line is earnestly suggested to our members.

With the advent of the hot nickel solution there may be little need for the so termed **high power** salts and perhaps much trouble averted. Many are the platers who have been "buncoed" into paying a handsome price for salts with curious names, because an agent with a glib tongue informed him they were imported from Europe and would make war on our methods of using double and single salts. Thanks to the A. E. S. the plater is now making his own and saving his employer money. Or better still, heat your old solution and see what can be accomplished. While the old world may have some peculiar features in deposition of metals this country stands foremost in nickel deposition on a commercial scale.

Publicity: Dr. Watts stated in his paper too much nickel plating is made to sell instead of wear. What would so much increase the popularity and extend the use of nickel plate as to have every bit of it which ever gets into the hands of the public put on to stay and thick enough to protect iron from rusting and to last for years. The members of the A. E. S. can do much to advertise the trade by getting the manufacturers to guarantee his wares or stove trimmings, automobile and bicycle accessories. typewriter or chandeliers as finish or plate that will actually wear and not "disappear over night."

What the Society sorely needs is a "Bureau of Publicity" or advertising, if you please, to properly inform, and endeavor to impress upon the manufacturer or employer, by general correspondence or otherwise, what the Society really stands for and what we are trying to accomplish. This the writer believes should serve to enlighten employers as to the position of the Society and many times would save many explanations to disagreeable questions regarding the object of the Society in general.

Perhaps it would be a good plan to draw up a set of questions and answers, such as, for example, "Is your plater foreman a member of the A. E. S?" "If not, why not?" "How can the manufacturer or employer be benefitted thereby?" showing how he is the gainer from a financial standpoint.

The co-operation of the employer is absolutely essential to the welfare of the society.

OSCAR E. SERVIS.

Trophies at the Convention

It has been suggested that two trophies be awarded at the coming convention; one to the Branch sending the best exhibit, and one for the best paper read during the convention. It shall not be necessary for the author to be present in person; the paper can be read by a delegate.

The trophies are to be the permanent property of the Supreme Society and contested for from year to year, the winners to take possession of them during the year and returning them at the ensuing convention.

There are to be no set conditions for the presentation of the papers. Every member, active, associate or honorary, can send in or present at the convention a paper dealing with some phase of electro-plating or finishing of metals. The convention to act as judges and the prize to be presented at a suitable time.

The exhibits to be plainly marked and sent to Secretary Walter Fraine, Dayton, Ohio. A whole Branch is to contest for the exhibit prize and no individual member is eligible for entrance, only as a member of his Branch.

The trophy should be in the shape of a loving cup or silver shield, properly mounted, with an inscription stating the object of the prize and a space for the winners' name of each year. It could be provided that any Branch Society winning for three consecutive years would become the permanent possessors of the trophy. For the payment of the trophies a subscription has been started and members wishing to donate to the fund may address any of the following officers who have been appointed a committee for the purpose by Pres. Hansjosten.

George B. Hogaboom, 561 Stanley St., New Britian, Conn.
Walter Fraine, 507 Grand Ave., Dayton, Ohio.
H. H. Williams, 2134 Nebraska St., St. Louis, Mo.

STANDARDIZATION OF PROCESSES USED BY ELECTRO-PLATERS

By C. C. Martel, Chicago Branch

It means brains, years of labor, the co-operation of all Electro-Chemists, Chemical Engineers, General Managers, Superintendents and Electro-Platers, also Engineers of methods, and in addition, all the large and small factories doing electro plating, the supply houses and manufacturing chemists.

Standardization means that all platers will use the same formulas. It also means an open book for the manufacturing concerns maintaining plating departments and not employing a foreman plater.

Standardization means: the plater who is saving thousands of dollars each year by making the greater part of chemicals used by the firm he is employed by, must discontinue doing so and must buy chemicals specified by the Committee on Standardization.

For example, I have four entirely different nickel solutions in my plating department. One is maintained at 12 deg. Beaume. This same solution is a hobby of mine; it is saving money for the concern as two girls and one boy are able to rack up, clean, plate and unrack 500 acetylene cycle lamps per hour. I furnish all details to the Standardization Committee, they accept my pro-

cess and adopt it as per the standard set. This will be gratifying to me as my method is right.

Another plater furnishes his data and does all that I am doing only he maintains his solution at 5 Be' during cold weather and 6 Be. during warm weather. Shall the committee adopt his method also? If so, I shall have to throw away my lead heating coil—value $25. If not, he will spend $25.00 for his concern reaching for my 12 Be' bright nickel.

Either he or I is going to spend $25 to live up to the standard for bright nickel.

Eight or ten years ago very few electro-platers used mechanical or electrical cleaners, whereas, I believe that ninety per cent are now doing so. Standardization of electric cleaners would enrich one jobber at another's expense. Similar cases surely would arise frequently which woud have to be patched up in some way. Consequently, our standard would be a running mate to Mr. Liscomb's boarding house hash.

No doubt there are many places where Standardization could and would be used and a great many where it could but would not be, as it would require laboratory equipment for the plating department, and the cost of installing a small laboratory in most of the plating departments would start the different cost departments looking up back numbers of the trade journals for ammunition to make the General Manager believe the foreman plater is a bluff and is trying to "flim-flam" the company.

Why not maintain three laboratories, one in New York City, for platers east of the Alleghanys, one in Chicago, Illinois, for the platers west of the Alleghanys and one in Toronto for the platers in Canada. The organization of each laboratory to consist of one or more chemical Engineers, a practical plater and office force. The above laboratories to be controlled by the Supreme Society, the Editor-in-Chief to have his office in one of the laboratories. All Branches not located in the three cities mentioned to have apparatus as specified by our Supreme President.

I also recommed that the three laboratories mentioned have forms of literature necessary for the instrutcion of E. M. F. and chemistry. We are living in a scientific age and the day of secrets in the art of electro-plating has gone by. Higher education is all the protection necessary.

Technical training is what is needed and we can only obtain this by maintaining our own correspondence schools. The above schools to teach only the science of Electro Deposition of Metals. I believe this would be all the Standardization necessary. As to financing this project, each member not having a technical education would be required to pay for this special training. Also each foreman plater could recommed one pupil each year, the said pupil necessarily would have to be employed in some plating department.

Subscription rates for the Monthly Review would help some. A great many manufacturers would be pleased to be in touch at all times with three such laboratories and would prove a large

factor in maintaining these Electro Chemical Engineering Laboratories. Of course, my suggestion means a large amount of hard work and cash, but I am confident our Society is capable of handling much harder problems.

But if Standardization is adopted by our Society, I Standardize also, and with the right spirit. Knowing as I do, that a large number of our members have spent the greater part of their lives in plating departments. Yes, and can show the marks of battle. Look at the hand held out by any electro-plater of long experience, and you will note a hand covered with scars. Also a hand that has wonderful strength. Yes, Gentlemen, a hand that has been used on the firing line. Not as a pencil juggler, no, indeed, but used for beautifying tons of useful articles by processes that required the handling of tons of the deadliest poisons. These are the men who are students and have been the better part of their lives.

The writer agrees with Supreme President Hansjosten that, "Criticism without sarcasm hurts no one and often opens our eyes to some defect in our methods that may be of great value to us." In conclusion, will state, in line with the above, your criticism is invited.

ANALYSIS OF A SILVER SOLUTION FOR FREE CYANIDE AND SILVER

By G. O. Morrison *

Analysis for Free Cyanide

1. Standard Solutions and Indicators:—
   (a) Silver Nitrate Solution (13.037 gms. per litre).
   (b) Sodium Chloride Solution (4.486 gms. per litre).
   (c) 1% Potassium Iodide Solution.
   (d) Saturated Potassium Chromate Solution.

2. Standardizing Standard Solutions:—

Fill one burrette with sodium chloride solution and one with silver nitrate solution.

Run in 20 cc. of sodium chloride solution into a beaker, add two to five drops of potassium chromate indicator and run in silver nitrate solution until a permanent red color is just obtained.

In the above titration 20 cc. of sodium chloride solution should require 20 cc. of silver nitrate solution. This is readily shown by a study of the equation governing the above titration.

$$\underset{(107.9+14+48)}{Ag\,N\,O_3} + \underset{(23.05+35.45)}{Na\,Cl} = AgCl + Na\,NO_3$$

$$(169.9) + (58.5)$$

From the above we see that 169.9 gms. of silver nitrate just react with 58.5 sodium chloride.

---

* Instructor in Electro Chemistry, Electro-platers' class, Toronto Technical School.

Then 13.037 gms. of silver nitrate will react with $(13.037 \times 58.5) \div 169.9 = 4.486$ gms. of sodium chloride. Therefore one litre of our standard silver nitrate solution should react with one litre of our sodium chloride solution. Hence 20 cc. of silver nitrate solution will react with 20 cc. of sodium chloride solution.

3. Titration for Free Cyanide:—

Fill one burrette with silver nitrate solution.

Pippette 10cc. of silver cyanide solution into a beaker, add about 50cc of distilled water and two to five cc. of 1% potassium iodide indicator.

Run in standard silver nitrate solution until a permanent yellow opalescence just occurs.

The silver nitrate solution is of such strength that:

$R \div 10 =$ Lbs. free cyanide per 10 Imp. Gals.

or $(R \times 1.2) \div 10 =$ Oz. Troy free cyanide per 1 U. S. Gal.

or $(R \times 1.44) \div 10 =$ Oz. Troy free cyanide per 1 Imp. Gal.

Where R = No. of cc. silver nitrate solution used in titration and 10 = No. of cc. silver cyanide solution taken for titration. This is shown by the following equation:—

$$\begin{array}{rcl} Ag\,N\,O_3 & + & 2\;K\;C\;N = Ag\,CN\,KCN + K\;NO_3 \\ (107.9+14+48) & + & 2\,(39.15+12+14) \\ (169.9) & + & 130.3 \end{array}$$

From the above equation we see:—

That 169.9 gms. silver nitrate just reacts with 130.3 gms. potassium cyanide. Then 13.037 gms. silver nitrate just reacts with 10 gms. potassium cyanide, or one litre of silver nitrate solution (13.037) with a solution of potassium cyanide which contains 10 gms. free potassium cyanide.

Now suppose the reading on the burrette were 25 cc. and the No. of cc. silver cyanide solution taken for titration were 10 cc. Then from the above we know that 25 cc. of silver nitrate solution (13.037) just reacts with a solution which contains $(10 \times 25) \div 1000 = .25$ gms. of free potassium cyanide. But the amount of solution taken for titration was 10 cc. Then in 10 cc. of solution there are .25 gms. free potassium cyanide. Therefore, in 100 cc. of solution there are $.25 \times 10 = 2.5$ gms. of free potassium cyanide. Now 2.5 gms. free potassium cyanide in 100 cc. is the same as 2.5 Lbs. potassium cyanide in 10 Imp. gals.

Now applying the rule:—

$R \div 10 = 25 \div 10 = 2.5$ Lbs. free potassium cyanide in 10 Imp. Gals.

Analysis for Silver

1. Standard Solutions and Indicators:—

(a) Ammonium sulphocyanate solution (7.037 gms. per litre).

(b) Iron nitrate solution (Iron wire dissolved in conc. nitric acid and boiled to oxidize to ferric state).

2. Standardizing Standard Solutions:—

Fill one burrette with silver nitrate solution and one with ammonium sulphocyanate solution.

Run in 20 cc silver nitrate solution into a beaker, add two to five drops iron nitrate indicator and about 50 cc. of distilled water. Run in ammonuim sulphocyanate solution until a permanent reddish brown color is produced.

In the above titration 20 cc. of silver nitrate solution should just require 16.6 nearly) cc. of ammonium sulphocyanate solution. This is shown by the following equation:—

$$Ag\ NO_3 + NH_4\ SCN = Ag\ SCN + NH_4\ NO_3$$
$$(107.9+14+48) + (14+4+32+12+14)$$
$$169.9 + 76$$

From the above we see that:—

169.9 gms. silver nitrate react with 76 gms. ammonium sulphocyanate. Therefore, 13.037 gms. silver nitrate react with $(76 \times 13.037) \div 169.9 = 5.828$ gms. sulphocyanate. Now our ammonium sulphocyanate solution has 7.037 gms. per litre. Therefore, one litre of it is equivalent to $7.037 \div 5.828 = 1.208$ litres of (5.828) ammonium sulphocyanate. But one litre of (5.828) ammonium sulphocyanate is equivalent to one 1.208 litres of (13.037) silver nitrate solution. Now if 1208 cc. silver nitrate solution is equivalent to 1000 cc. ammonium sulphocyanate solution, then 1 cc. silver nitrate solution is equivalent to $1000 \div 1208$ cc. of ammonium sulphocyanate solution and 20 cc. silver nitrate solution is equivalent to $(1000 \times 20) \div 1208 = 16.6$ cc. (nearly) ammonium sulphocyanate solution.

3 Separation of the Silver.

Pippette 10 cc. of silver cyanide solution into a 300 cc. beaker and add 100 cc. of distilled water. Bring this to a boil and either add ammonium sulphide solution or pass in hydrogen sulphide gas, slowly at first until in excess. Boil slowly until precipitate settles. Now filter and test filtrate for silver by passing in hydrogen sulphide. Wash the precipitate with hot water until free from cyanide solution, keeping as much precipitate as possible in beaker, and put filter paper with precipitate on it back into beaker in which precipitation was done. Now add about 8 cc. of hot distilled water and about 8 cc. of conc. nitric acid and boil until all silver sulphide is dissolved. The equation for the separation of silver is:—

$$2\,AgCN\,KCN + (NH_4)_2S = Ag_2S + 2\,KCN + 2\,NH_4CN$$
or
$$2\,AgCN\,KCN + H_2S = Ag_2S + 2\,KCN + 2\,HCN.$$
$$Ag_2S + 2\,HNO_3 = 2\,AgNO_3 + H_2S$$
$$3\,H_2S + 2\,HNO_3 = 4\,H_2O + 2NO + 3\,S.$$

4. Titration for Silver:—

Now add two to five drops of iron nitrate indicator and 100 cc. of cold distilled water and titrate with ammonium sulphocyanate solution. The ammonium sulphocyanate solution is of such a strength that:—

$R \div 10 =$ Lbs. of silver in 10 Imp. Gals.
or $(R \times 1.2) \div 10 =$ Oz. Troy in 1 U. S. Gal.
or $(R \times 1.44) \div 10 =$ Oz. Troy in 1 Imp. Gal.

Where R = No. of cc. ammonium sulphocyanate solution used in titration and 10 = No. of cc. of silver cyanide solution taken for titration.

This is shown by the following equation:—

$$Ag\ NO_3 + NH_4SCN = Ag\ SCN + NH_4\ NO_3$$
$$(107.9+14+48) + (14+4+32+12+14)$$
$$169.9 + 76$$

From this equation we see that:—

76 gms. ammonium sulphocyanate react with 169.9 gms. silver nitrate or 107.9 gms. silver. Therefore, 7.037 gms. ammonium sulphocyanate react with $107.9 \times 7.037 \div 76 = 10$ gms. silver, or 1 litre of ammonium sulphocyanate (7.037) reacts with a solution of a silver salt which contains 10 gms. silver.

Suppose reading on burette is 25 cc. No. of cc. silver bath taken = 10 cc. Then 25 cc. of (7.037) ammonium sulphocyanate reacts with solution which contains 25 gms. of silver. But amount of solution taken was 10 cc. Hence .25 gms silver in 10 cc. or 2.5 gms silver in 100 cc. or 2.5 lbs. silver in 10 Imp. Gals., hence rule $R \div 10 = 25 \div 10 = 2.5$ lbs. silver in 10 Imp. Gals.

The analysis for free cyanide as compiled, can also be used for the determination of free cyanide in a copper cyanide solution.

ORMULA DIPS AND DIPPING

By F. A. Shepherd, Buffalo Branch

As I have been asked to prepare a paper on the above subject, I will first call your attention to a Question and the Answer, as given in the Metal Industry, January 1915, issue.

Q.—Could you give me any information regarding the "Ormolu" finish on brass work of the best French periods? Is the color superimposed or is it due to the peculiar mixture of the metal. I do not, of course, refer to the modern "Ormolu" finish one sees mentioned in books and which is obtained by various lacquers and is only an imitation.

A.—Ormolu finish of the French periods resulted from the peculiar combination of the brass mixture and dipping acids used to produce the soft velvety lustre. The high or relief surface was then hand burnished.

Frequently the metal was gilded by the mercury process. The term then applied was "Ormolu Gold." Twenty-five or thirty years ago there was considerable of such art metal goods upon the markets of the world, especially clocks, candelabra, etc. The gilt color was frequently imitated by the aid of lacquers colored by organic pigments such as red sanders, gamboge, turmeric, annatto, etc. The American imitations of this splendid finish are nearly all produced upon an antimonial lead base, by the use of acid copper deposits and acid dips which are afterwards burnished, gilded or lacquered.

French ormolu mixtures contain a larger proportion of copper than common brass. The following is one of the usual compositions.

Copper	72.43
Zinc	22.75
Tin	1.87
Lead	2.95

The above will be enough for the history, and although brief it covers it well enough for our purpose, so we will take up some of the uses and adaptations of the Ormula finish. Among the articles best adapted for this finish may be mentioned parts of gas fixtures, such as shells, stems, arms, brackets and the different castings used in the ornamental parts of the fixtures. But probably the largest field and most common lines wherein the best effects are produced is in the manufacture of metallic advertising novelties, where such articles as watch fobs, hat and stick pins and various other novelties as well as class pins and medals of all descriptions are finished, either with the original ormula, or, as it is more commonly called, "Matt" finish, or is frequently, on the better grades of goods, struck up in the different colored gold solutions or is sometimes colored with lacquers of various shades. Another article that used formerly to be matt dipped and flashed in gold was picture frames made of "dip metal" but which are now mostly made of white metal, duplexed and gold plated.

Arrangement and Formulae of Dips: In using ormula dips it is very essential that there be good ventilation first and foremost, as the heavy brown fumes arising from the dips when in operation are very detrimental to the health, producing a choking sensation and making it difficult to breath. There are numerous cases on record where victims of these fumes have been laid up for several days. It might be interesting to describe the sensation, as given by a victim. It was the custom to operate the dip for about fifteen minutes and then stop for a while, this was done on this particular order but as only a couple of baskets of work remained to be dipped he decided to finish the job. When he had completed the work he was entirely exhausted and had to fight for breath. It seemed as if the walls of his throat were trying to force themselves together and it was painful and difficult to breath. When the air was forced through and entered the lungs it was more painful and it seemed that there was a heavy pressure coming from both the back and the chest. As difficult as it was to get the air to enter the lungs it was more difficult to exhale it. This lasted for about an hour and a half, after which, although painful to breath, it was not so difficult, but the choking sensation remained for about six hours. It took three days to recover from the effects of the acid just to save about twenty minutes on the order.

As there are at least four dips required, it is necessary that a hood be constructed—preferably of wood—extending out far enough to take all the fumes, and tapered to connect with an exhaust fan. The inside of hood and all parts that may be subject to the acid fumes or steam should be given several coats of asphaltum paint.

Where it is impossible to have a separate room for the dips, they should be constructed to fit in the corner of a large room, not only to save space, but for the sake of convenience and efficiency, and the container should be so constructed that it may be closed when the dips are not in use. The ventilation, although important as far as the health is concerned, is also as important for the success of the dipping operation as well.

The dips are usually constructed in ten or fifteen gallon crocks or jars and are surrounded by either hot or cold water. There are usually two dips for the matt, one of them coarse and the other finer in their effects. Then there is also a bright dip that is used after matting to bring out the finish good and clear, even this should be surrounded with cold running water. The tank holding this dip should be partitioned off so as to be able to rinse off first in the water that surrounds the jar and then passed to the other side of the partition in to the fresh, clean water, then into the cyanide dip (1 lb. of cyanide to 10 gal. water, then into another tank of clean water, then into clean hot water that is arranged with an overflow with clean water running in at all times, with a steam coil to keep it constantly boiling. This is very important, as, if all other conditions are correct and the final hot water treatment is neglected, the finish is spoiled. The work should then be quickly and thoroughly dried in clean hot sawdust, keeping it in motion all the time. It is important that the sawdust used should be of a kind that will not stain the work. Muslin gloves should be worn while drying off matt-dipped work as it is very readily stained if the hands come in contact with it.

The matt or ormula dip should be surrounded with hot water in a trough specially constructed either of iron or porcelain, if of iron, it should be lead lined, with a steam coil arranged for heating. **Be sure that no water gets into the dip at any time as this would spoil it.** Although this all seems clear and easy in manipulation, there are very few men who are successful with matt dips, as the finish is easily spoiled in any of the different stages and may all be carefully looked after and then spoiled in the final operation of lacquering. If successful, and the lacquer best adapted for the work is found or determined, don't experiment or change it under any circumstances, otherwise in time you will find that you have either of these: White scales, too shiny or the velvety effect is spoiled by being filled up, stains showing through where the lacquer is not of good body, or the color of the finish is spoiled by the lacquer.

Dips and Equipment: First there should be a hot pickle composed of water with 10% sulphuric acid. This is one of the aids to an even finish.

Second, a dip called the "black boil," composed of about one or two gallons of a worn out bright dip with the addition of nitric acid to make five gallons. This dip is used for oreide or metals of the bronze order, and is used to take off the fire scale on work that is stamped several times and has to be annealed,

this is best used after the last stamping operation. The pickle should be surrounded with cold water.

Third, the necessary bright dips for the work in view.

Fourth, a hot potash kettle, don't have the potash too strong, neither should it be too weak. It should be just strong enough to slightly discolor the work. Cyanide dips, plenty of clean hot and cold water, clean hot sawdust, stoneware dipping baskets, copper wire for stringing up work, good clear lacquer and an oven for drying it.

A formula that is being successfully used is as follows: Sulphuric acid, 15 lbs.; nitric acid, 15 lbs.; hydrochloric acid, 5 ozs.; zinc sulphate, 5 lbs.; potassium nitrate 1 lb. First put the sulphuric acid in the jar to be used, then add the zinc salt and stir well with a wooden paddle, add the potassium nitrate, which should be in powdered form, stir well and then slowly add the nitric acid. Add the hydrochloric acid last with constant stirring. The jar should be covered and let stand over night in cold water. Experienced men can use this dip on any of the various mixtures of brass or bronze and produce some very fine work. The different metals require different proportions of the formula to obtain the best results. Some points are: If the matt is too coarse, add more sulphuric acid, this lessens the effect of the nitric acid and makes a smoother grained and even matt. If the matt is too smooth or not heavy enough, add more nitric acid. When dipping brass or metals that have a larger proportion of zinc it should contain more nitric acid, on the other hand, metal with a large content of copper should contain more sulphuric acid.

If the work comes out too bright, add more sulphate of zinc slowly and stir well. The zinc seems to form a protection and it is claimed that it protects the copper and only allows the action where it is not in contact.

If the work comes out too dull, add more nitric acid and stir well.

A matt dip for gas fixture shells, etc.: Sulphuric acid, 3 qts.; Nitric acid, 1 qt.; Zinc sulphate, 4 ozs.; Potassium nitrate, 1 oz.; Flower of sulphur, 1 oz. Mix the two acids, add the zinc, then the salt petre and lastly the sulphur.

Methods of using dips and Finishing: If it is found necessary to pickle work, do so, and work that has been annealed should go through the preliminary black boil before the last operation of stamping. Work should be wired so that it does not touch or cover up the parts to be matted. Small work can be done in stoneware baskets, put in only enough so that the pieces can be well shaken and allowed to get the action of the dip. Run through potash solution, shake well and then put into matt dip, be sure to stir the dip well with wooden paddle and have it hot. When the dip is properly made and stirred well it has a milky appearance. Put the work in the dip directly from the potash and be sure that no water gets into it, the potash has no effect, it will form either potassium or sodium nitrate. Let

the work remain in the dip as long as it boils up around the wires or hooks, as a rule, when the boiling stops the work is sufficiently matted. It should then be taken out, well rinsed in water, passed through potash and then into bright dip, again into running water, through hot water and quickly into hot sawdust. If the high lights are to be burnished it should be done with dry tools. The work is then ready for lacquering.

CONDUCTORS FOR COPPER SOLUTIONS

By S. F. Taylor, Newark Branch

Copper solutions are perhaps used more than any one of the other plating solutions, with the possible exception of nickel. As the ingredients in these solutions are good conductors in themselves, a large part of the copper solutions are used without the addition of any conducting salts except the copper compound used and cyanide. This does not apply to the acid copper solution, which always has a large amount of free sulphuric acid as a conductor.

We will first consider the acid copper bath. This solution is usually made by dissolving copper sulphate in water until it stands 12 degrees Beaume, and adding sulphuric acid until the hydrometer shows 16 deg. Be. If a solution was made of copper sulphate ($CuSO_4$) alone and electrolyzed, the ammeter would show a reading and a deposit of copper would be obtained. This would show that $CuSO_4$ is a conductor. If, however, the current strength and anode surface were kept the same and some sulphuric acid (H_2SO_4) were added, the ammeter would show a higher reading and the copper deposit would not only be increased, but the deposit would be of a finer and better structure, thus proving that sulphuric acid is a good conductor in a copper sulphate bath and is necessary for good deposits.

In a solution of $CuSO_4$, one molecule breaks up into two small parts, copper being one and the SO_4 radical the other. These are called ions and are the substances which conduct the current in solution. Substances which do not break up into ions in solution are non-conductors, sugar being an example; solutions of this salt do not conduct the current.

When the solution of $CuSO_4$ is electrolyzed the Cu is deposited at the cathode and the SO_4 radical travels to the anode, there it combines with an atom of Cu from the anode and forms a molecule of $CuSO_4$. This molecule of $CuSo_4$ again breaks up into ions of $CuSO_4$ and the same process is repeated.

When H_2SO_4 is mixed with water the H_2SO_4 breaks up into a large number of hydrogen (H) and SO_4 (sulphate radical) ions. The more highly a substance breaks up into its ions, the better conductor it is. As sulphuric acid in water breaks up into a large number of ions it is a first class conductor. Then what part does sulphuric acid play in a $CuSO_4$ bath? When dilute H_2SO_4 is electrolyzed the 2H is deposited at the cathode and the SO_4 radi-

cal is deposited at the anode; there the SO_4 radical combines with some Cu from the anode, forming $CuSO_4$ which goes into solution. The Cu is deposited at the cathode and the SO_4 radical combines with the 2H to form H_2SO_4. This process is repeated over and over again and the supply of acid and copper is kept constant. In plain language, when a solution of $CuSO_4$ and H_2SO_4 is mixed and the whole electrolyzed, the H_2SO_4 furnishes so many more SO_4 radicals to combine with the copper from the anode that so much more copper is deposited from solution than if $CuSO_4$ were used alone, and this $CuSO_4$ is the real conducting power.

In the cyanide copper solutions there are several salts added for conducting purposes, but, as copper cyanide and sodium or potassium cyanides are such good conductors, a large number of platers do no use any other salts in their solutions. The chief conducting salts used for cyanide solutions are, copper, cyanide, sodium and potassium cyanide, bi-sulphite of soda, carbonate of soda and hyposulphite of soda. We will eliminate the sodium and potassium cyanides, as they are necessary for the depositing of the metal, and just consider those which are not **actually** necessary for the deposit of copper. Bi-sulphate of soda ($NaHSO_4$) seems to have a tendency to keep the anodes clean and also helps to keep the deposit bright. The amounts that platers use varies, some solutions using as low as 1½ to 2 oz. per gallon, while others' solutions contain as high as 7 and 8 oz. per gallon. As a bi-sulphate of soda is an acid salt it will neutralize cyanide unless first neutralized by carbonate of soda which has an alkaline reaction; 5 oz. of bi-sulphate of soda will neutralize 1 oz. of KCN, if, for instance, 5 oz. of $NaHSO_3$ is added to one gallon of solution, it will neutralize one ounce of free cyanide which should be replaced by that amount. Carbonate of soda (sal soda) is also used in copper solutions in amounts varying from 3 to 8 oz. to the gallon. The claim is made by some platers that it is of no real value in a copper solution, while others claim that the metal can be deposited faster without burning, and that the deposit is of a finer texture when carbonate of soda is used; the latter claim being its chief asset.

Hyposulphite of soda ($Na_2S_2O_3$) is very commonly used in copper solutions as it helps to give a clear deposit and also keeps the deposit bright. The amounts recommended vary from 1-10 of an ounce to 2 ounces per gallon. It is used chiefly as a brightener.

Ammonium chloride (NH_4Cl) is also used, but it is claimed that the chlorine liberated during electrolysis has a tendency to attack iron.

Ammonium sulphate $(NH_4)_2$ (SO_4) is used by some platers with satisfactory results.

DETERMINATION OF COPPER IN COPPER PLATING SOLUTIONS

By Charles Piske, Newark Branch

Measure from a burette into a 250 cc. breaker, one avoirdupois assay gallon (or 13.35 cc.) of the solution to be assayed; add 10 cc. C. P. sulphuric acid and 50 cc. of water, then a piece of sheet aluminum, about one inch square, heat to boiling, allow to stand about one honr, or until solution is colorless; at this point a few drops of hydrogen sulphide water added to the solution will show whether all copper has been reduced, if so, add 100 cc. water, filter on a weighed porcelain Gooch crucible, in which a fibre asbestos pad has been inserted, or on tarred filter papers; wash until free from acid, dry at a 100° C. (not over an open flame, or copper will oxidize and results will be high,) then weigh.

CALCULATION. Number of decigrams found will correspond to avoirdupois ounces in U. S. gallon, times 3.95 will equal ounces of copper sulphate in the gallon.

Note: Where metals other than copper are present in solution they will be reduced and cause erroneous results.

ELECTRO-COLORING OF METALS*

By P. Tressidder

Having been called upon for a paper on electro-coloring of metals or antique finishes, it is no easy task to describe the different finishes and how they are produced. We all know that antique finishes, as a rule, are first copper-plated and then stained or oxidized. Of course, many of these finishes are just plain oxidized on brass, copper or silver.

However, there are a number of finishes that are straight electro-plated or electro-deposits as they are called. The most durable finishes are obtained in this way and in your first attempts to produce them it is well to be guided by the experiences of others. The reason I say this is because, first, electro-coloring of metals is an expensive undertaking, and for one with no previous experience to try to obtain these finishes would find it hard and in some cases he would lose both time and money before getting the looked for results.

I have found one thing of great value to me in the past and would recommend it to other platers, that is, the keeping of notes in experimenting for a new color. In electro-plating it is always wise to keep notes for this reason; First—you may find several colors of future value before securing the one you are looking for. Second—at the present time they may be of little interest to you. Third—Some day in the future you may be called upon to furnish one of those very finishes that you passed up thinking they were of no value. For these reasons I say it is wise to keep notes on all colors you may find, as in this way you

*Read at St. Louis Branch Banquet, Jan. 23, 1915.

will find that you not only save useless labor and money but you will save time, yes, you will save that experiment, for in your note book you will find a greater friend than in the long hours of just trying. I have made it a practice to keep such notes and at the present time have close on to 100 such finishes and their formulaes.

I have found that mostly all platers seem to dislike the use of Arsenious acid, yet it is one of the most valuable chemicals in the plating room when properly used, for with the use of Arsenious acid we can obtain many finishes, in fact, nearly all black nickel solutions contain arsenic and some of the best French grey and gun metal finishes are produced with arsenious acid, a combination of arsenic, muriatic acid and iron carbonate make a good French grey or black on brass, copper or silver. The formula for this solution is as follows:

Muriatic acid	1 gal.
Iron Carbonate	2 oz.
Arsenious Acid	¾ lb.

This solution can be used with or without current, but when using it with current, a small piece of sheet iron should be used for an anode and run with two volts, not over, but better a little under. This is one of the most satisfactory finishes and will stand a great deal more than black nickel. Of course there are other finishes produced with sugar of lead and Sodium Hydroxide but they are not as lasting as the former, although they seem to deposit very much alike in color.

One of the hardest finishes to produce is the Verde Antique or Tiffany Green such as is used on fixtures and novelties. After some trying experiments I was able to produce this finish at a small cost. It is a pretty antique finish of olive green and brown and has the appearance when taken from the bath of a highly polished enamel but can be made matt by leaving out in hot water for a few minutes before drying. This finish does not have to be lacquered or waxed, for it has a metallic deposit and will stand up as good as nickel plate.

I am not at present in a position to give a list of formulaes, although I intend later on to publish a list of different finishes in the Review, but should any member of the Society request a finish or need any assistance that I could give, I will be only too glad to give it.

If I had been called on to read a paper on modern coloring of metals, such as oxidizing or lacquering, I could have spoken for an hour on that one subject, for there has come into the plating room one of the valuable things we can find in the way of producing different finishes, it is in the spraying outfits, and with such lacquers and so called enamel like are furnished by the Celluloid Zapon Co. Nearly every known finish can be furnished that is known in the art of plating.

Last, but not least, we will soon find in every modern plating room installed one of these air compressors and use the spray or so called air brush, for with it the plater not only saves

the time he would waste in experimenting but would be able to produce the exact color needed.

THE RELATIONSHIP OF CHEMISTRY TO MODERN INDUSTRY

By A. E. Kienth, Milwaukee Branch *

Our esteemed friend, Mr. Yaeger, was kind enough to ask me to attend one of your meetings, and if possible, to make a few remarks on the relation of chemistry to modern industry.

Having had more or less experience in industrial chemistry, I will attempt to relate to you some of the phases and values when applied in the plant, and not from the standpoint of a scientist. I will not say that a highly trained chemist is at present necessary for the ordinary routine work, such as is required for factory control, but that any intelligent person with a love for knowledge, can, with a little diligent study, fit himself to understand the chemistry of the processes employed in his particular industry and so much familiarize himself with technical chemistry as to successfully apply it to his business. If you will give modern industry but a moment's thought you will find that practically all are founded on chemistry and physics.

Take the tannery, a purely chemical change from raw hide to leather; the soap business, from grease and lye to soap and cleansing materials; the paper mill, from wood to paper; the distillery, from corn to whiskey; the Portland cement of today, and last, but not least, nickel plating and so on indefinitely. It is not only that these industries are based on chemistry, but their commercial success depends on the constant chemical control of the factory. Let us take, for example, the iron and steel industry. Right from the jump, the iron ore as it comes from the mines must be analized, the percentage of iron in the ore must be determined in order to fix the selling price—how long would a Blast Furnace Co. last, that paid $5.00 a ton for an ore, which contained 50% of iron, while its competitor paid $5.00 a ton for a 70% ore? Then, from the blast furnace the pig iron is sold to the foundry. The foundry people desire to form a casting—this casting is to do a certain work, now do you know—that the percentage of Manganese, Sulphur, Carbon, Silicon, Phosphorus in the completed casting determines its quality, i. e., a certain percentage of these elements is necessary to either make it brittle or hard, or tough and soft, consequently, you see it is absolutely necessary to **know** the percentage of these elements in the pig before casting to get a desired result, and the only means of control are by the application of chemistry. What would it mean to a large foundry, which in a haphazard way, poured a few large fly wheels that were to be tough and have a great tensile strength, if they came out of the mold as brittle as stove plate? Therefore, the success of the enterprise depends absolutely on the chemical control. This is one phase of the business.

* Chemist, Milwaukee Water Works.

Now let us take a peep into a tanning laboratory. Here each and every article that is bought by the firm is analyzed as the cost of most articles is based on the analysis, furthermore, in this laboratory, daily routine analysis of Chrome liquor, tanning liquor, etc., are made to determine the strength of the solutions and to find the quantity of chemical necessary to bring them up to their standards.

Out at the laboratory of the Water Works we buy all our coal and brass fittings on analysis, the coal companies guaranteeing us a coal containing a certain number of heat units per pound at a fixed price, if the coal is higher in heat units than the guarantee, we pay them a bonus, if lower, we make a deduction. In 1914 we made deductions from $125.00 to $400.00 a month for North Point alone. This has certainly proven an economy for the city, since we pay for just what we get.

There are still a number of industries that are based on Chemistry that do not employ chemists. Among them is especially yours, namely that of nickel-plating a purely electro-chemical process, and, gentlemen, this wave of commercial efficiency that is sweeping the world, will also brush by you, and will sweep with it, those who are not prepared to meet it. There is no doubt that the time is here when a knowledge of Chemistry will be of great value to the plater: there is hardly a day in which some little thing doesn't go wrong in one of your tanks, perhaps not enough nickel in one; too much potassium cyanide in another, or too much or not enough acid or alkali; it is the little things that can be corrected with just a reasonable knowledge of Chemistry. Furthermore, the quantitative analyses of materials you buy—the nickel anode, the potassium cyanide, the tin, the zinc, etc., no doubt many is the time that some unscrupulous concern has slipped one over on your firm. Now there is no excuse for this and the time is coming when the firm will pay a higher salary to the man that can protect its interests and each and every man interested in his own welfare can fit himself to do this by the study of Quantitative Analysis.

Quantitative Analysis, therefore, forms the strongest and most powerful lever for Chemistry in its application to the practical purposes of life to the trades, arts and manufactories. It teaches the mineralogist the true nature of minerals; it is indispensable in Pharmacy and medicine and every branch of industry derives some advantage from its practical application. It is by the use of Quantitative Analysis, that we are enabled to produce better glass, rubber, iron, porcelain, paints, drugs, etc.

I advise everyone desirous of studying Analytical Chemistry to arm himself with a considerable share of patience and remind him that it is not at one bound, but gradually, and step by step, that the student may hope to attain the necessary certainty in his work and to obtain accurate results, which will be of practical benefit to his employer and himself.

THE PLATER'S BOOMERANG

By E. G. Lovering, Detroit Branch

Just a few short words of consolation to the old-time platers, who are observing and can take a peep into the future, and see, as it were, the handwriting on the wall, regarding our gigantic strides, and wonderful progress, which our so-called profession has made in the past few years.

Through time, hard study, costly experimenting, and more than one sleepless night, dreaming over some perplexing problem of chemical construction, whereby he could produce a color, finish, or plate, he has advanced himself and his craft, step by step, to the highest grade of efficiency, and let me say commercial perfection, till he has almost reached a point where he is about to standardize his formulas, and work out all his past difficulties by fixed rules. No more groping in the dark, they tell us. The Thumb and Rule methods are dead and buried in the past. He organizes educational societies, edits trade journals with the sole purpose of developing and keeping wise to what the other fellow has accomplished.

Now, admitting that united we stand, individually we fall, and that intelligence reigns supreme, is this knowledge to act as a boomerang and return to the head that sent it forth to his detriment, or will we collectively and individually reap the harvest from the seed we have planted, or have we become intoxicated with the exuberance of our own verbosity, so that our ship has drifted out to sea, and our supplies are left on shore, or have we fortified our front and left our rear open to attack? Have we developed so fast that we have brought the electrodeposition of metals, commercially speaking, up to a mechanical proposition, where it does not require the services of a high salaried plater to produce results and turn out a maximum production?

Getting down to "Brass Tacks," is it not possible at the present stage of the game, assuming that a real plater has developed his department to first-class running order, for a subordinate, or helper, of the foreman polisher, without chemical or scientific knowledge, only knowing that one line of work, to continue hanging in and taking out, mechanically producing by the end of the day as much as the high priced plater did? "But," you will say, "when the solutions go wrong there is trouble." Now here is where, methinks, we have left our supplies and ammunition in the enemies' trenches. The subordinate, or assistant who falls heir to the throne is ambitious, and desires to make good. He is born with the "I'll show 'em" temperament, so he writes his troubles to the trade journal and also gets in touch with the agent of their supply house, who sees a large order for supplies in sight, gets quickly on the job and works diligently to fathom the mystery, and occasionally you will run up against an agent, although seldom, who has a little practical knowledge of plating, in general, however, he has at his command the company's chemical catalogue, so he

is bound to see something, and betwixt and between they manage to get things running, perhaps not so well as before, but enough to satisfy the firm that they are saving a plater's salary.

An incident was brought to the writer's attention by a high class plater who heard through an agent that a certain Michigan firm was having trouble, so at liberty and open for engagement he called on them.

He found the "Supt." in deep thought, devouring a copy of So and So's "Plating Made Easy," etc. Not wishing to disturb one so studious, he stepped back, and surveyed his surroundings. On a shelf were several books on Electro Deposition, also the current issue of the "Liver of Sulphur Monthly," the "Perfect Fitting Deposit Journal," etc.

Suddenly the "Supt.," becoming conscious that there was some "higher knowledge" in close proximity to him, turned around, so the plater stepped forward and introduced himself. Not detailing the conversation, this remark was made by the Superintendent: "Young man, the day of high priced platers is a thing of the past. We have a young man in our plating room and with the help of these books and one supply man, we manage to get along nicely, thank you." And I believe his "thank you" was quite "apropos." As who else but the platers should he thank? Think it over. Another case of a firm in this state who in the past employed a real plater, but for sagacious reasons he had to retire. Another plater being at liberty, seeing an opening, was met with this remark: Why, we haven't had a plater since Mr. Expert left and we seem to get along all right with the help of the trade papers and a man that comes here with supplies. Bang! goes another illusion.

A plater in one of our large commercial shops, who, through many years of conscientious and consistent work, got things running smoothly in his "Dept," increased their output, introduced new and up to date methods for producing results at a minimum cost and, according to old time business practice should have been handsomely rewarded; but in these days of higher education and enlightened agents the firm thought they were being buncoed by a high-priced man, instead of reaping the benefit of practical knowledge, and substituted a cheaper man, and believe me, their plating room is not yet. But the Expert being the progressive kind became an agent. So "the world do move."

However, the plater tells me that he doesn't think he will be very successful as an agent, as his conscience troubles him at times, when he finds himself in one of those places where they need professional advice. Such as the brass solution not working just right, and he knows by looking at it that all it needs is a little cyanide. But as he is on a commission basis, he has to unload a barrel of glue, or a wonderful new cleaning compound, one hundred pounds of carbonate of what not, and a lot of other stuff that he as a practical man knows that they do not need.

I could mention many other cases that are sure food for thought, but will not venture further on your good graces, and will let some one else testify to their experiences on the same lines.

COMMENT AND CRITICISM

In the January Review a request was made for information on "How to test lacquer for durability." I got into communication with twelve of the largest lacquer manufacturers in the country. All of their replies are so nearly identical I deem it best to save space by grouping it under one head.

"The matter of testing lacquers is not necessarily a chemical proposition so much as a matter of purely physical test. For instance, different lacquers are subject to different conditions. I will try, as far as possible, to enumerate some of the different conditions that have to be met with in different lacquers, and just how tests are made to ascertain whether or not a lacquer is suitable for this particular purpose.

"First of all, on most classes of work, especially polished brass, copper, etc., it is necessary to have a lacquer that is absolutely free from acid, otherwise, after the lacquer is applied, the work will tarnish. In order to determine in a practical way whether or not a lacquer is free from acid, a small quantity is placed on a piece of brass and dried rapidly by means of heating. If there is acid in the lacquer, the brass will be turned green in some places.

Second: When lacquered goods are put out by different manufacturers, they endeavor to obtain a lacquer which is not readily attacked by the different solvents, which would be used by a house in cleaning the lacquered articles. One concern with which the writer was familiar, took articles which had been lacquered with different lacquers, and washed them with different solvents, such as Benzole, Alcohol, Potash, Ammonia, Acetone, Gasoline, etc. Most lacquers will resist ordinary solvents such as alkalis, etc., with the exception of Acetone, Alcohols and Amyl Acetate.

If it is desired to use a lacquer on steel to prevent corrosion, the best method which the writer knows of is to subject sample pieces coated with different lacquers to weather conditions. In order to hasten this, the work can be hung over a tank, which is constantly kept boiling. Another way which is quite practical, is to submit them to a rust box, which consists of a box having a quantity of salt water solution made up with about 10% salt. This is atomized into the chamber, thus having a salt atmosphere at all times. Ordinary lacquers will not stand this test more than a few hours. So far as we are able to state, no concern makes a laquer which is a so-called rust proofing material. It will, of course, prevent rusting to a certain extent, but it is not up to the standard of some of the well known rust proofing processes.

"Fourth: In a great many cases, in fact, almost all cases, it is necessary for a lacquer to resist abrasion. Usually, if it will resist scratching with the finger only, it is considered fairly satisfactory lacquer. In some cases, however, people desire a more severe test, and of course, these tests have to conform to the conditions under which the lacquer will be used. For instance, metal buttons are subject to a continual rubbing on cloth. Therefore, the usual test is to subject a lacquered button to a certain number of rubs on a piece of cloth. Seventy rubs, I believe, is considered satisfactory by the United States Government.

"In your letter you state that the electro platers to-day, if you receive a large or small quantity of lacquer, want to analyze it to determine the lasting qualities. Permit me to say that to the plater as well as to the ordinary chemist, not well posted in the manufacture of lacquer, a chemical test means almost nothing. In fact, even large chemical laboratories do not always resort to chemical tests to determine the durability of lacqueer or some other similar product. We find in all cases that practical tests, which about duplicate the conditions to which the material will be subjected, with perhaps considerable exaggeration, to hasten the results, are decidedly more satisfactory than a chemical test.

"Our ——— was with the ——— Company for several years as a chemist, and he states that when it was a matter of testing the lacquers or similar products, he did not try to analyze the material, but relied on practical tests, such as outlined above, to find suitable lacquer for their different requirements. He states that every different condition requires a different test, which, of course, is perfectly obvious.

"The conductivity of solutions varies considerably with the temperature, increasing about 2 per cent for a use of 1 degree." From "Conductivity of Liquids" by Olin Freeman Tower, Ph. D., Prof. of Chemistry, Western Reserve University.

JOSEPH WALTERS.

The Proper Metallic Content of a Nickel Solution

The proper metallic content of a nickel solution is the metallic content which is best suited to the work in hand. This does not seem to be a very definite answer, and it is not, and no definite answer can be given where articles of various shapes and sizes are to be plated in the same solution, and time is valuable. The most satisfactory general solution the writer ever worked was one with 1¼ ozs. of metal to which was added 1 oz. common salt to each gallon. The anode surface worked below that of the cathode surface and the corrections made by adding carbonate of nickel and hydrochloric acid. Right here is where I will get into argument with some one, for I know that nearly all platers contend that hydrogen should be evolved at the cathode. Theoretically, it should not, but we cannot work on

theory alone when our employers are crying **"rush."**.. The solution referred to evolves hydrogen very copiously and a white froth is formed continuously around the work when all the current which can be used is passing through the solution. The hydrogen gas does not gather in little bubbles and remain for a second or so on the work, but comes away as fast as formed, as does the gas from a cyanide solution. There is no occlusion, and no pitting. I cannot give the amperes required per square foot of surface, because the employer in that place would not buy an ammeter, I did, however, succeed in getting a volt meter and was able to ascertain the voltage. I could use 3½ volts on almost any class of work, and pieces with rounded surfaces—not too large—would stand 4½ volts. At another place I used a nickel solution with 2½ ozs. metallic content with 1 oz. hydrochlorate of ammonia to each gallon. Our principle product in nickel was drawer suspensions for office filing cases, measured 2½" by 25½", formed of 16 gauge cold rolled steel and were assembled.. These suspensions were hung in the tank in a vertical position and as close together as we could get them without touching. The voltage used was, as given me by an electrician with a portable voltmeter, about 4 volts, with the anodes about 4 inches distant. I do not know how nearly correct this is, but anyway, I used current enough on seventy of the suspensions to heat a half inch iron rod a good cherry red. This rod was bent in U shape and was used for the first step in the rheostat. The solution was very satisfactory on the class of work we were doing as well as basket work, but when we attempted to plate large objects suspended horizontally we had pits galore if we reduced the current to a point where deposition would take place without burning. If we increased the current to the point where the hydrogen would escape as fast as formed it eliminated the pitting. The surface nearest the anode would always be coarse, or even burned, when plating the large pieces of various shapes. However, the suspensions first mentioned were plated in fifteen minutes and were neither pitted nor burned, the deposit withstanding the hammering of the final assemblers to bring them to the correct form.

It will be seen that, in my experience, the metallic content of a nickel solution must be governed by the class of work. The writer only knows too well that some employers will say, the John Smith Hardware Co. plate a certain class of work in a certain number of minutes while we require twice that. But the John Smith Hardware Co. are a much larger firm than we and has solutions which take care of only one particular class of work, while we must get a hundred different varieties through the one solution.

While I say that the standardization of solution is impossible where the highest efficiency is demanded, yet, for a general purpose solution, I should not care to have more than 1½ ozs. of metal with a conducting salt of chloride of ammonia or that of sodium and enough of it to permit of a rapid dissociation of the

metal. Of course, such a solution requires frequent additions, owing to the negative ions migrating faster than the positive and the solution being robbed of its metal. However, where speed is demanded under any conditions we are forced to resort to means which cannot be considered the strictest economy.

E. S. THOMPSON.

Comment Committee

The Comment Committee as appointed by Mr. Joseph Walters, consists of—Royal F. Clark, H. J. Ter Doest, H. J. Richards, William Voss.

To the Editor of the Monthly Review:

Answering the query as to why a strongly adhering deposit of nickel is not obtained on electrically cleaned polished steel surfaces without an intermediate coating of copper, will say that this question is one which might involve the influence of the electric current on the steel. If the steel is one which retains the current to any great extent in the magnetic form, there certainly would be an electrical action set up which would materially effect the adhesion of the deposit. The coating of copper would retard this, but not eliminate the possibility of the nickel stripping at a later date. The necessity of the copper, though, denotes that the trouble is in the cleaner. If the steel is the ordinary cold rolled product, the trouble must be in the cleaner depositing a foreign metal (sodium for instance). As sodium is deposited at either pole in the circuit under certain conditions, a reverse current would have no effect.

There is a cleaner on the market which leaves cold rolled steel in a condition to receive and hold a nickel deposit, even under the process of bending. Would suggest that the plater look to his cleaning solution, also to the density of his nickel solution.

E. S. THOMPSON.

To the Editor of the Monthly Review:

A member of the A. E. S., located five hundred miles from the nearest branch of the Society is surely in a position to enjoy the "Monthly Review" to the fullest extent. To a plater so situated it seems a sad pity that the valuable space of the paper should be taken up by writers who do not adhere to subjects of interest to platers, but devote themselves to the "looney" sayings of the "Cooker of the Cook." This should be tabooed unless it can be shown that the "Elderly Naval Man" developed into an authority on organic compounds in hot solutions.

To one who looks forward to the arrival of the "Review," and who reads and re-reads every page, it would seem justifiable to "smother his squeals in the scum of the boiling broth."

We have societies devoted to Friendship, Love and Truth, and churches where the Bible is taught, but our Society is purely educational and devoted to Electro-plating, and the Bible,

although a storehouse of wisdom, is not the place we go when we have "platers' troubles.' '

The writer has always considered Electro-plating a very modern science and can see no reason for one writing for publication in the "Review" to let his mind wander back to the time of Moses. Did Pharoah's horses wear plated mountings on their harness, and was the "Golden Calf" merely an electro-plated article?

It is true that the position of the Comment and Criticism Committee is important and requires supreme knowledge and keen sense of duty to perform without fear or favor, but would a man of this calibre feel qualified to take the position to tell the members "wherein we were wrong?" When a member of the Society is persuaded by the Librarian to write upon a subject wherein he has been more or less successful, he should not be squelched by a flood of sarcastic criticism from members who DID IT ANOTHER WAY. Such criticism is a PROD, because the writer has offered the best he had and it should be received for what it is worth.

Our Society is composed of men who would not let "coarse or vulgar denunciation" enter into our arguments, but criticism in its broad sense will incite the writer with backbone to defend his position; and arguments so started will occupy valuable space in our "Review," and be as uninteresting to the searcher for truth as a long harangue, bristling with the personal pronoun "I."

E. W. HEIL,
1724 Jackson Ave., Wichita, Kan.

WHAT THE BRANCHES ARE DOING

NOTE TO THE SECRETARIES—All correspondence for this department must be in the hands of the editor by the 15th of each month.

SUPREME SOCIETY

Meets first week in June, 1915, at Dayton, Ohio. Secretary, Walter Fraine, 507 Grand Avenue, Dayton, Ohio.

NEW YORK

Meets fourth Friday of each month at 258-262 Pearl Street, New York City, 8 P. M. Secretary, Joseph Minges, 148 Schenck Avenue, Brooklyn, N. Y.

The regular monthly meeting was held February 26th, with President Haddow in the chair. The laboratory is commencing to get in shape for use and we are to soon get some results from it.

Our sixth annual banquet was held Saturday evening, February 20th, and was a grand success, there being one hundred and ninety-seven platers and their friends present. A display of finishes by numerous members was an interesting feature. After everybody had satisfied the inner man, Mr. Harry de Joannis,

editor of the Brass World, opened the ceremonies with a few witty remarks, and introduced Professor Joseph W. Richards of Lehigh University, who described the evolution of electro metallurgy from electro-plating, showing that electro-plating is the father of electro metallurgy. Dr. Hiram Lukens, University of Pennsylvania, was next introduced and gave an instructive talk on solutions and how to find their metallic content in a simple, quick manner. Mr. A. K. Seldon of the Crocker-Wheeler Co., described the evolution of the modern dynamo. Mr. de Joannis concluded the banquet with a few remarks, lauding the Society for its work in the past and wishing it success for the future.

CLEVELAND

Meets second and last Saturday of each month at Central Y. M. C. A. Secretary, Charles Werft, 331 Strathmore Avenue, Cleveland, Ohio.

At our last meeting, February 27th, Mr. E. S. Thompson read a very original paper entitled "Reaction of a Nickel Solution." Mr. Thompson gave some very unique theories for pitting, peeling, and the slime in the bottom of a nickel solution. At an early date this paper is to be taken up for discussion.

Mr. R. H. Sliter of the Cleveland Branch gave a very interesting talk on the testing of lacquers, that was well received, and showed samples of French Bronze finishes.

The Cleveland Branch has decided to hold a smoker in the near future; the committe has the arrangements well under way. The date will be published later.

CHICAGO

Meets fourth Saturday of each month, 8 P. M., Western Building, Randolph Street and Michigan Avenue. Secretary, H. E. Willmore, 5911 South Boulevard, Chicago, Ill.

At the regular meeting of this Branch, held February 27th, nickel solutions came in for the usual amount of discussion. The matter of suggesting amendments to the present Constitution was also discussed and a committee was appointed for the purpose, consisting of the following: E. Lamoureaux, H. E. Wilmore, J. H. Hall.

Several questions appeared in the Question Box. Some of them follow, accompanied by the conclusion of Librarian Fred J. Liscomb:

Q. No. 1. What is a hard nickel deposit?

The meaning of the term "hard deposit" is indefinite. It may mean a deposit that is hard to buff, or it may mean one that is brittle.

Q. No. 2. How is it produced?

A deposit that is hard to buff sometimes results from the use of too great a current density in securing a heavy deposit. It is probably due to occluded hydrogen.

Q. No. 3. Advantages, if any, and why?

There is no advantage for ordinary purposes.

Q. No. 4. What is a malleable nickel deposit?

A malleable deposit may be said to be the reverse of a hard deposit and may be produced by a lower current density, or by the addition to the solution of chemicals that will oxidize the hydrogen and thus prevent its occlusion. Boric acid is frequently used for this purpose, often in the presence of some soluble chloride, such as common salt. This latter salt tends to reduce the resistance of the solution to a point where the voltage required is just sufficient to deposit the nickel without decomposing an excess amount of water. It has been remarked that either a malleable deposit or one that is denser can be produced from the same solution by changing the current conditions. This is probably due to the fact that the manipulation of the current affects the amount of occluded hydrogen.

Q. No. 5. How is it produced?

See answer to question No. 4.

Q. No. 6. Advantages, if any, and why?

The advantage of a malleable deposit lies in the fact that it can be buffed with a minimum effort, thus lessening the liability of cutting through the edges and sharp corners.

Q. No. 7. Would like to know which is preferable, a hard nickel deposit or a malleable nickel deposit?

The answer to this question can be drawn from the preceding answers.

Q. No. 8. Which deposit is preferable when it is in constant use, standing the perspiration of the hands?

Nickel, while very useful in many ways, cannot be depended upon to stand the action of certain organic acids and compounds. Beer has a bad effect on nickel; cheese will remove nickel from a steel knife in a few days unless the instrument is cleaned each time it is used. The perspiration of the hands will mar the appearance of some of the noble metals, and it seems to be the opinion of many that nickel will not withstand the action of perspiration, whether it be a hard or a malleable deposit or even rolled nickel.

Chicago Branch takes this opportunity of thanking the publishers for a bound volume of the Metal Industry for 1914.

BUFFALO

Meets first Saturday of each month at the University of Buffalo, 8 P. M. Secretary, John G. Murphy, 71 Dingens Street, Buffalo, N. Y.

The regular monthly meeting was held Saturday, March 6th. There was a good attendance and several discussions, among them being the articles in the "Review" on spotting out, etc.

Mr. John L. Back had two topics for the evening. "Silver Deposit Work" and "The Engineer, Druggist, Doctor, Dentist, and other Professions." The substance of it was that, as the different professions were required by law to be licensed, it would seem to be a foregone conclusion that it would be only a question of time when it would be the same with the plater, and it would probably be the manufacturer that would bring this about for their own protection. As an example, he mentioned

the law for poisons and drugs, and pointed out how the plater buys arsenic by the barrel and cyanide by the case, etc., where people unacquainted with their nature could do a lot of damage, and the case of the Emery Glue plater being a danger to the community at large by his promiscuous disposing of large quantities of cyanide solutions and other deadly poisons through the sewers that empty into rivers and other bodies of water that are in turn used for drinking, etc. He also suggested the thought that this might be the cause of many so-called diseases that are supposed to be epidemic and sometimes bother the doctors.

At the next meeting, Mr. Becker will deliver a paper on "Lacquers and Lacquering, and Mr. Brown one on "Black Nickel."

TORONTO

Meets fourth Thursday of each month at Occidental Hall, Bathurst and Queen Streets. Secretary, Ernest Coles, 13 Laurier Av., Toronto, Ont.

The regular meeting was held February 25th, with President Magill in the chair, and a good turn out of members who voted the evening as a decided success.

A bound volume of the Metal Industry for 1914 was received with the compliments of the publishers, and a hearty vote of thanks was accorded to them for their kindness in presenting same to Toronto Branch.

It was decided to hold an open meeting in place of the regular meeting on April 22nd, and present indications point to a very interesting program.

Mr. W. S. Barrows spoke briefly on "Specialization," and Mr. E. Coles spoke on "Job Shop Practice," both speakers being well received.

In the September issue of the Review, a question was asked by one of our members in reference to the tarnishing of oven doors on malleable iron ranges, and requesting that replies be sent to the secretary of Toronto Branch. We have not yet received any answers and have come to the conclusion that the matter has been overlooked. If there are any members working on this line of work, we would be glad to have some suggestions on the subject or to put them in communication with the member requiring them. Now, let us see the real spirit from you who are working in this line, and any suggestions will be sincerely appreciated.

(In the November Review, page 18, will be found an answer to the above question by Mr. Joseph Walters.—Editor.)

PHILADELPHIA

Meets first Friday of each month in the Harrison Laboratory Building, University of Penna., 34th and Spruce Streets, Philadelphia, Pa. Secretary, Philip Uhl, 2432 North Twenty-ninth Street, Philadelphia, Pa.

The regular monthly meeting of this Branch was held

March 5th, with President Dinan presiding, and was well attended.

This Branch will hold an annual banquet in November, also two open meetings in March and September for the purpose of new members.

A committe of three were appointed on Lectures, and a committee on Sociability and Membership.

Mr. August Heck exhibited finishes he made in 1887, and from their appearance, were still in good condition.

Messrs. Dinan, Barr, Uhl, Gold, Sturdevant and Kuntz of this Branch had the pleasure of being at the banquet of the New York and Newark Branches, and report a pleasant and enjoyable time.

Dr. Lukens of the U. of Penna. will deliver a lecture at the April 2nd meeting on Silver Solutions as to the metal content, also how to maintain same from the anodes. This meeting is looked forward to with great interest, as we expect a number of invited guests, with the object of interesting them to become members.

Mr. Joseph L. Dinan, President of this Branch, has affiliated with the Celluloid Zapon Co. of New York, and will represent that firm in New York and vicinity. Mr. Dinan was a charter member of this Branch and its first recording secretary, which office he held until June, 1914, when he was elected president. He has our best wishes for success in his new venture.

DAYTON

Meets first Wednesday of each month at the Y. M. C. A., Dayton, Ohio. Secretary, Alphonz Lamoureux, 500 East First Street, Dayton, Ohio.

On Wednesday, March 3rd, this Branch held its regular meeting, which was well attended and much enthusiasm was displayed. We had the pleasure of a visit of Mr. Troxler of Newark Branch, who gave an interesting talk on gold and silver solutions, which was much appreciated. He also gave an interesting demonstration of the Crown Rheostat, the manufacturer of which he is traveling representative.

The work of arranging the details of our forthcoming convention is progressing very nicely.

On Saturday, April 10th, we shall hold a banquet at the Algonquin Hotel for the manufacturers and their friends in Dayton and surrounding territory, and should any of the members of neighboring Branches be able to attend, we shall be pleased to welcome them. After a splendid menu has been disposed of the following program has been arranged:

Introduction ..... Walter Fraine

The A. E. S. Its Objects and Benefits to the Manufacturer..... J. H. Hansjosten

Address ..... F. O. Clements, C. E.

Song..... Leo. Wills, accompanied by Miss Mandie Moore

The Relations of Educational Societies to the Manufacturer..... C. F. Kettering

Diversions.....F. J. Cyrex
Address.....E. Lamoureux
Impromptu Remarks

NEWARK

Meets first and third Friday of each month, 8 P. M., 47 Bank Street, Newark, N. J. Secretary, Chas. A. Stiehle, 46 West Madison Avenue, Irvington, N. J.

At the meeting, held February 19th, the following visitors were present: George B. Hogaboom, Past Supreme President; Joseph L. Dinan, President of Philadephia Branch, and Mr. Harry de Joannis of Bridgeport. Speeches were delivered by each one, and they all spoke highly of our equipment for research work. The study of copper is still being followed, and much interest is manifested by all who attended.

The office of "Head Chemist" was established at the last meeting, and Mr. Chas. Piske was appointed to fill the position. Mr. Piske has been of very great service to our Branch. He never tires in trying to solve the platers' problems from the chemical standpoint, and he makes the explanations so clear that all may understand.

An open meeting will be held March 19th, with an address by Prof. J. W. Richards of Lehigh University, "The A. B. C.s of Electro-plating," and a demonstration of bright nickel solutions, by Mr. J. R. King of Newark.

CINCINNATI

Meets once each month at Dennison Hotel, Cincinnati, Ohio. Secretary, F. H. Nordman, 720 Froom Ave., Cincinnati, Ohio.

ROCHESTER

Meets second and fourth Friday of each month at University of Rochester. Secretary, C. V. Haring, 603 Dewey Avenue, Rochester, N. Y.

ST. LOUIS

Meets fourth Saturday of each month at Public Library, Assembly Rooms. Secretary, H. H. Williams, 2134 Nebraska Avenue, St. Louis, Mo.

BRIDGEPORT

Meets third Friday of each month at the office of the Brass World, 260 John Street, Bridgeport, Conn. Secretary, Nelson Barnard, 858 Howard Ave., Bridgeport, Conn.

DETROIT

Meets first Friday of each month at Prismatic Hall, 140 1st Street. Secretary, B. E. Miller, 545 Townsend Avenue, Detroit, Mich.

MILWAUKEE

Meets first Friday of each month at Eagles Hall, 137 Second St., Secretary, E. C. Yaeger, 962 Ninth St., Milwaukee, Wis.

APPLICATIONS FOR MEMBERSHIP

Cleveland—
J. H. McAuliff ..... 1122 St. Clare St., Cleveland, Ohio
Dayton—
Ralph A. Carr
Newark—
William B. Jones..... 234 Harrison Ave., Harrison, N. J.

ELECTED TO MEMBERSHIP

Philadelphia—
Geo. E. Coller..... 433 S. 9th St., Reading, Pa.
Otto W. Mott..... 2228 Fountain St., Philadelphia, Pa.
John H. Dorricott..... 5533 N. 2nd St., Philadelphia, Pa.
W. J. McManimin..... 1554 E. Berks St., Philadelphia, Pa.
Bridgeport—
Roger Sherman Sperry..... 21 Cook St., Waterbury, Conn.
J. Henry Stitt..... 185 Madison Ave., New York, N. Y.
Edward J. Meehan..... 27 Orchard St., Waterbury, Conn.
Wm. B. Price..... 111 Euclid Ave., Waterbury, Conn.
Wm. H. Flaherty..... 994 Hancock Ave., Bridgeport, Conn.
Thos. F. Conners ..... 415 Poplar St., Bridgeport, Conn.
Dayton—
Jos. M. Johnson..... 32 Sycamore St., Mansfield, Ohio
Edward A Koehne..... 734 W. 4th St., Dayton, Ohio

CHANGE OF ADDRESS

H. H. Posbeck..... 5325 Berteau Ave., Chicago, Ill.
W. J. Lawrence..... 6012 N. 11th St., Philadelphia, Pa.
Alfred T. Mix (Correction)..... 27 Imlay St., Hartford, Conn.